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Futility of Targeted Fish Tariffs and an Alternative

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Abstract *Targeted tariffs are a common tool used by importing countries to protect domestic fish producers. Unfortunately, such tariffs, in general, are ineffectual. The reason is twofold. First, fish tend to be homogenous across supply sources, which means a tariff on one supply source acts as an implicit import subsidy to other supply sources. Second, source-specific import shares tend to be small, which means that the import demand elasticity is large, both absolutely and in relation to the import supply elasticity. As a consequence, most of the tariff is borne by foreign producers rather than domestic consumers. Indeed, analysis of a \$0.50/lb. tariff on catfish imports from Vietnam indicates that the tariff would increase the US price by at most \$0.17/lb. in the short run and \$0.11/lb. in the long run. In light of this, and the potential for retaliation, a better policy option may be market promotion. To examine this, an expression is developed to indicate the optimal promotion levy. Applying the expression to catfish, results suggest that a levy of between 2% and 4% on imports would be optimal in the sense that the induced promotion expenditure would maximize foreign producer surplus. As a bonus, domestic producer surplus would increase in that spending levels more nearly match the economic optimum.*

Key words Anti-dumping, Dorfman-Steiner theorem, generic advertising, tariffs, tax incidence.

JEL Classification Codes D4, F1, Q17.

Introduction

Thanks to an expanding, export-oriented aquacultural sector and international agreements that have *inter alia* restricted access to coastal fisheries (Anderson and Fong 1997), some 40% of world fish production now enters international trade (Dommen 1999). One result has been growing protectionism (Wessells 1998). Recent examples from the US include 4% to 7% and 15% to 31% countervailing duties on salmon imports from Chile and Norway, and a 91% to 200% duty on crawfish imports from China (Roberts 2002; Wilson 2000). At issue in this article is not the merits of the rulings that led to these tariffs, rather their economic logic. In particular, the reason for imposing the tariffs is to assist domestic producers by raising the domestic price. However, a targeted tariff's ability to accomplish this is dubious, as is clear from elementary trade theory.¹ Given

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¹ Empirical evidence is not inconsistent with theory. For example, in his analysis of the salmon tariff, Asche (2001, p. 354) concludes: "the anti-dumping and countervailing duties on Norwegian salmon did not benefit US farmers to any extent, but only led to other producers taking over Norwegian salmon market share." With respect to crawfish, Roberts (2002, p. 1) states: "[t]he tariff remedy had limited impact." Brester, Marsh, and Smith (2002) reach similar conclusions with respect to a US tariff on Canadian slaughter cattle. For a cogent general discussion of the tariff issue with respect to farmed fish, see Asche (1997).

the large sums spent litigating the cases, and the high costs of monitoring compliance with what amounts to an ineffectual policy, this theory should be revisited.

The purpose of this research is to determine the effects of a targeted tariff on the US catfish industry. Catfish is a useful case study in that a rapid rise in imports from Vietnam (see table 1) has led to intense lobbying for a protective tariff (Cooper 2001). In addition, sufficient econometric analysis has been conducted to gain a sense of the magnitudes of key elasticities that govern a tariff's impact. Catfish is similar to salmon and crawfish in that product differentiation is weak. As well, the tariff under consideration is targeted rather than general. Hence, results for catfish are applicable to crawfish and salmon. As a byproduct of the analysis, I consider the spillover effects of a targeted tariff on imports from non-targeted sources, an issue that has received relatively little attention. The analysis concludes with consideration of a policy alternative: namely, market promotion.

In the next section I present the model and basic results. The model is then simulated to determine the effects of a hypothetical \$0.50/lb. tariff against Vietnamese imports on the US price. I then discuss a tariff *cum* promotion as an alternative to a straight tariff. The paper concludes with a summary of key findings.

Analysis

Prior to model specification, a review of the catfish "trade war" is in order. Before 1999, catfish imports accounted for less than 2% of domestic consumption and thus were a non-issue. However, starting in 1997 imports from Vietnam began to grow at an exponential rate, so that by 1999 Vietnam had supplanted Brazil and Guyana as the top exporters to the US. Indeed, Vietnam's share of the US frozen fillet market increased from 1.6% to 13% between 1999 and 2001 (table 1). That this growth was price driven appears undeniable. In particular, the price of Vietnamese catfish between 1999 and 2001 dropped from \$2.04/lb. to \$1.26/lb., while the US price held steady at about \$2.73/lb.² This price advantage increased Vietnam's import share relative to its international competitors, particularly Brazil. However, most of the growth appears to have occurred at the expense of US producers. One indicator is that despite steady domestic production levels between 2000 and 2001, the US frozen fillet price dropped from \$2.83/lb. to \$2.61/lb., and the farm price dropped from \$0.75/lb. to \$0.64/lb. (table 1).

In response, the domestic industry adopted a three-pronged strategy (Cooper 2001). First, it sought legislation to require that catfish imported from Vietnam be labeled. Second, it lobbied for renegotiation of the Vietnam-US trade agreement (ratified by Congress in October 2001) to set limits on catfish imports. Third, it filed an anti-dumping petition with the US International Trade Commission (USITC) as a first step toward a tariff and import quotas. The first prong has met with some success (Brasher 2001); the second is doubtful; and the third is pending (Davis 2002).³

At issue here is the efficacy of a tariff, should the third prong prove successful. To that end, I adopt an equilibrium displacement modeling approach similar to the

² The price advantage enjoyed by Vietnam has been ascribed to quality differences. This has been difficult to document. What seems clear is that production costs are at work. Specifically, *Pangasius hypophthalmus*, the main catfish species believed to be imported from Vietnam (*WorldCatch* 2001), attains market weight in 6 to 8 months (Jepsen 2000). This compares to a year or longer for *Ictalurus punctatus*, the species grown in the US.

³ A preliminary determination of dumping was issued by the US Department of Commerce in January 2003. A final determination, which provides for the imposition of duties, is expected in late July or early August 2003. The calculated average dumping margin is 63.88% (Spetrini 2003, p. 19).

Table 1
Imports, Production, and Prices, US Catfish Industry, 1998–2001

Variable	Definition	Value			
		1998	1999	2000	2001
M_V	Imports from Vietnam (mil. lbs.)	0.6	2.0	7.0	17.1
M_R	Imports from Rest-of-World (ROW) (mil. lbs.)	0.8	1.4	1.2	1.0
S	US production of frozen fillets (mil. lbs.)	113.5	120.0	119.7	115.0
X	US exports of frozen fillets (mil. lbs.)	0.3	0.2	0.6	0.2
D	US consumption ($= M_V + M_R + S - X$)	114.6	123.2	127.3	132.9
v	Vietnam's quantity share ($= M_V/D$)	0.005	0.016	0.055	0.129
r	ROW's quantity share ($= M_R/D$)	0.007	0.011	0.009	0.008
u	US's quantity share ($= S/D$)	0.990	0.974	0.940	0.865
P_V	Vietnam price (\$/lb.) ^a	2.01	2.04	1.52	1.26
P_{US}	US frozen fillet price (\$/lb.)	2.69	2.76	2.83	2.61
Q_F	Farm production (live weight, mil. lbs.)	564	597	594	597
P_F	Farm price (¢/lb.)	74.2	73.7	75.0	64.5
Q_W	Wholesale quantity, all products (mil. lbs.)	281	293	297	296
P_W	Wholesale price, all products (\$/lb.)	2.31	2.34	2.38	2.25

Source: USDA, ERS (2002); Crews (2002).

^a FOB price Vietnam. Shipping cost to the US is estimated to be about \$0.50/lb.

one used by Kinnucan and Myrland (2002) to analyze the effects of the Norway-EU salmon agreement. The model herein focuses on the frozen fillet market, since most imports from Vietnam are in that product form. A key assumption is that frozen catfish fillets are undifferentiated across supply sources, an assumption consistent with industry efforts to secure mandatory labeling. In addition, we assume that domestic and international markets are sufficiently integrated such that the Law of One Price (LOP) holds. The US is assumed to be a “large-nation” importer with respect to Vietnam; hence, changes in US import demand influence the Vietnamese price.

With these assumptions, the basic model is as follows:

$$D = D(P_{US}) \quad (\text{US demand}) \quad (1)$$

$$S = S(P_{US}) \quad (\text{US supply}) \quad (2)$$

$$M_V = M(P_V) \quad (\text{US imports from Vietnam}) \quad (3)$$

$$M_R = M(P_{US}) \quad (\text{US imports from ROW}) \quad (4)$$

$$P_{US} = P_V + T_V \quad (\text{US price}) \quad (5)$$

$$D = S + M_V + M_R \quad (\text{US market clearing}) \quad (6)$$

where D and S represent domestic consumption and production, respectively; M_V and M_R represent US imports from Vietnam and Rest-of-World (ROW), respectively; P_{US} is domestic price inclusive of the (hypothetical) per-unit tariff T_V ; and P_V is the Vietnamese price exclusive of the tariff. Note that since the tariff is applied only to Vietnamese imports, ROW exporters to the US respond to P_{US} , which is higher than

P_V . Thus, the tariff provides an implicit subsidy to ROW producers who have access to the US market.

The model contains six endogenous variables (P_{US} , P_V , D , S , M_V , and M_R) and one exogenous variable (T_V). We implicitly assume that frozen fillets are strictly separable from all other goods, at least as a first approximation. Exogenous variables that affect supply and demand other than the tariff are suppressed. United States exports of catfish are negligible (see table 1), and thus ignored, as they complicate the analysis without having any material effect on results.

Comparative Statics

To determine the tariff's effect on the US price, we first express the model in log differential form as follows:

$$D^* = -\epsilon_{US} P_{US}^* \quad (1)$$

$$S^* = \epsilon_{US} P_{US}^* \quad (2)$$

$$M_V^* = \epsilon_V P_V^* \quad (3)$$

$$M_R^* = \epsilon_R P_{US}^* \quad (4)$$

$$P_{US}^* = (1 - \tau_V) P_V^* + \tau_V T_V^* \quad (5)$$

$$D^* = \epsilon_{US} S^* + \epsilon_V M_V^* + \epsilon_R M_R^*, \quad (6)$$

where the asterisked variables refer to relative changes (*e.g.*, $P_{US}^* = d\ln(P_{US}) = dP_{US}/P_{US}$); ϵ_{US} is the domestic demand elasticity for frozen fillets in absolute value; ϵ_{US} is the domestic supply elasticity; ϵ_V and ϵ_R are import supply elasticities; $\epsilon_{US} (= S/D)$ is the US quantity share; $\epsilon_i (= M_i/D)$ $i = V, R$ are import shares for Vietnam and ROW, respectively; and $\tau_V = T_V/P_{US} < 1$ is the *relative* tax rate; *i.e.*, the per-unit tax divided by the US price in initial equilibrium. In this study, different notation is used for domestic (ϵ_{US}) and import supply elasticities (ϵ_V and ϵ_R) to reflect the fact that the latter include responses of consumers as well as producers in the respective exporting countries.

The tariff's effect on the US price is determined by solving equations (1) – (6) simultaneously for P_{US}^* to yield:

$$P_{US}^* = \tau_V T_V^*, \quad (7)$$

where:

$$= \epsilon_V \tau_V / [\epsilon_V \tau_V + (1 - \tau_V)(\epsilon_{US} + \epsilon_{US} \epsilon_{US} + \epsilon_R \epsilon_R)]. \quad (8)$$

Noting that $\tau_V = T_V/P_{US}$, equation (7) can be expressed more simply as:

$$dP_{US} = dT_V. \quad (7a)$$

For normal parameter values $\epsilon_V < 1$. Hence, from expression (7a) a one dollar increase in the tariff always causes the US price to rise by less than one dollar. The reason for this is clear from equation (8): a tariff-induced rise in the US price discourages domestic consumption (ϵ_{US} parameter), encourages domestic production (ϵ_{US} parameter), and encourages increased imports from the untaxed source (ϵ_R parameter). Any one these factors weakens the tariff's price effect. That all three work in tandem highlights the difficulty. For example, Brazil or Guyana could easily redirect its exports from (say) Europe to the US in response to a tariff-induced rise in US price. Moreover, the incentive to do so is strong, as the tariff simultaneously raises price in the US market and lowers price in ROW markets. This implies that ϵ_R is quite large. In the limit where $\epsilon_R = \infty$, $\epsilon_V = 0$ and the tariff has no effect on US price. This, in essence, is the analytical case for believing that targeted tariffs are futile. It provides theoretical support for Asche's (2001) and Brester, Marsh, and Smith's (2002) empirical findings that targeted tariffs do little to assist US producers.

Tariff Incidence

Further insight can be gained by deriving the expression for tariff incidence. For this purpose, we delete equation (3) (since we want to treat P_V as temporarily exogenous) and solve the remaining equations simultaneously for M_V^* in terms of P_V^* and T_V^* to yield:

$$M_V^* = -\epsilon_V P_V^* - \left[\epsilon_V / (1 - \epsilon_V) \right] \epsilon_V T_V^*, \quad (9)$$

where:

$$\epsilon_V = (1 - \epsilon_V) (\epsilon_{US} + \epsilon_{US} \epsilon_{US} + \epsilon_R \epsilon_R) / \epsilon_V \quad (9a)$$

is the US demand elasticity with respect to imports from Vietnam. From equation (9) the import demand curve is downward sloping ($-\epsilon_V < 0$), and an increase in the tariff shifts the curve to the left ($[-\epsilon_V / (1 - \epsilon_V)] \epsilon_V < 0$), as expected. More to the point, equation (9a) indicates that the import demand curve becomes more elastic as: (i) domestic consumers or producers become more sensitive to price (larger ϵ_{US} or ϵ_{US}), (ii) Vietnam's international competitors become more sensitive to price in their allocation of supplies to the US market (larger ϵ_R); and (iii) US reliance on Vietnam as a supply source decreases (smaller ϵ_V). In particular, ϵ_V as $\epsilon_V \rightarrow 0$, which reflects the well-known "small-nation" trader effect. Since the tariff simultaneously contracts ϵ_V and expands ϵ_R and ϵ_{US} , it enlarges ϵ_V , which further undermines the tariff's efficacy, as will become apparent.

Substituting equation (9a) into equation (8) yields:

$$= \epsilon_V / (\epsilon_V + \epsilon_V), \quad (8)$$

which is the familiar tax incidence relation. Specifically, expression (8) indicates the extent to which the tariff is borne by US consumers as opposed to Vietnamese producers. A small value for ϵ_V implies that ϵ_V is large in relation to ϵ_V . One way this can occur is if ϵ_R is large, as has been discussed. Another way is if ϵ_V is small, as is true in the present case ($\epsilon_V < 0.13$), and would be true generally when the tariff is targeted and supply from the targeted source constitutes a small fraction of domestic consumption.

Effects of a \$0.50 Tariff on US Price

To demonstrate the foregoing ideas and provide information germane to the current policy debate, we “simulate” equation (8) to determine the effects of a hypothetical \$0.50/lb. tariff on US price. This tariff approximates the lower-bound dumping charges contemplated in the Commerce Department’s preliminary determination. The implied shift in the excess supply curve (about 22% in the price direction based on 2001 data values) is outside the 10% limit suggested by Piggott (1992, p. 133) for equilibrium displacement modeling. Thus, some caution is required in interpreting results in that approximation errors grow with the size of the displacement.⁴ In the simulations, the ϵ_i parameters are set to their 2001 values as given in table 1. Domestic supply and demand elasticities are taken from the literature. In particular, ϵ_{US} is set alternatively to 0.71, 1.42, and 2.13. The 0.71 value is based on Kinnucan and Miao’s (1999) estimate of ϵ_{US} for *all* catfish products. Since demand for frozen fillets is likely to be more price elastic than the demand for all catfish, $\epsilon_{US} = 0.71$ is taken as a lower-bound estimate, and the elasticity is doubled and tripled to provide a plausible range. The domestic supply elasticity, ϵ_{US} , is set to 0.73, Zidack, Kinnucan, and Hatch’s (1992) long-run estimate of this parameter measured at the farm level. Although ϵ_{US} refers to a wholesale-level elasticity, the parameter values at the two market levels should be similar, since raw fish is a constraining input in processing. To analyze short-run effects, we set $\epsilon_{US} = 0$, Zidack, Kinnucan, and Hatch’s estimate for a time horizon of approximately 16 months.

No empirical estimates exist for ϵ_V and ϵ_R . Intuitively, these elasticities might be larger than ϵ_{US} (a domestic supply elasticity), as the ϵ_i are *import* supply elasticities and thus reflect consumer as well as producer responses to price within the respective exporting countries. Moreover, we expect ϵ_R to be larger than ϵ_V , since the former elasticity reflects a *diversionary* effect. That is, an increase in the tariff on Vietnamese imports simultaneously raises the US price and lowers the ROW price. Since non-Vietnamese exporters are not subject to the tariff, they have a double incentive to redirect exports to the US market, as discussed earlier. Hence, we assume $\epsilon_V \in [1, 3]$ and $\epsilon_R \in [2, 10]$, where the lower limits correspond to short-run elasticities. Since, at present, imports enter duty free, we set $\epsilon_V = 0$.

Results

Results indicate that for the considered parameter values, a \$0.50/lb. tariff on Vietnamese imports would cause the US price to rise by at most \$0.17 in the short run and \$0.11 in the long run (table 2). Stated differently, the US’s incidence of the tariff is at most 34% in the short run and 22% in the long run. Incidence is lower in the long run because an increase in ϵ_{US} causes import demand to become more elastic in relation to import supply [see equation (9a)], which means more of the tax is borne by the foreign supplier. The mean price rise is between \$0.047 and \$0.115 for short-run simulations and between \$0.031 and \$0.082 for long-run simulations. The middle value for the long-run effect is \$0.058. Taking this as a “best-bet” estimate, it appears that only about 12% of the tariff will appear as a rise in the US price once markets have fully adjusted. Hence, the tariff in essence punishes Vietnamese exporters with little reward for US producers.

⁴ If the supply shift is measured using an integrated market model, the vertical displacement is much smaller, on the order of 2.8% (= 22% x Vietnam’s share of domestic consumption (0.128)). Thus, approximation error computed on the basis of the shift in the excess supply curve may be more apparent than real.

Table 2
Effect of a \$0.50 Tariff Against Vietnamese Imports on US Price

Parameter Value	Short Run ($U_S = 0$)			Long Run ($U_S = 0.73$)		
	$v = 1$	$v = 2$	$v = 3$	$v = 1$	$v = 2$	$v = 3$
(----- (¢/lb.) -----)						
$U_S = 0.71$						
$R = 10$	6.9	12.1	16.2	4.1	7.6	10.6
$R = 8$	7.0	12.3	16.4	4.2	7.7	10.7
$R = 4$	7.2	12.6	16.8	4.2	7.8	10.9
$R = 2$	7.4	12.8	17.1	4.3	7.9	11.0
$U_S = 1.42$						
$R = 10$	4.0	7.3	10.3	2.9	5.4	7.7
$R = 8$	4.0	7.4	10.3	2.9	5.4	7.7
$R = 4$	4.1	7.5	10.5	2.9	5.5	7.8
$R = 2$	4.1	7.6	10.6	2.9	5.5	7.9
$U_S = 2.13$						
$R = 10$	2.8	5.2	7.5	2.2	4.2	6.0
$R = 8$	2.8	5.3	7.5	2.2	4.2	6.0
$R = 4$	2.8	5.3	7.6	2.2	4.2	6.1
$R = 2$	2.8	5.4	7.6	2.2	4.3	6.1
Mean Value	4.7	8.4	11.5	3.1	5.8	8.2

Based on equation (8). See text for details.

Sensitivity Analysis

The foregoing results are insensitive to R (since R is tiny), but quite sensitive to v . Since US consumer incidence rises with v , it is important that v not be understated to prejudice results against the tariff. To investigate this issue, let:

$$Q_X + Q_{US} + Q_{NUS},$$

where Q_X is Vietnam's total exports of catfish, Q_{US} is Vietnam's exports to the US market, and Q_{NUS} is Vietnam's exports to non-US markets. Taking the derivative of this expression with respect to P_V yields:

$$Q_X / P_V = Q_{US} / P_V + Q_{NUS} / P_V .$$

Multiplying this expression through by P_V / Q_X yields:

$$e_S = (Q_{US} / Q_X) v + (Q_{NUS} / Q_X)_{NUS}, \quad (10)$$

where $e_S [= (Q_X / P_V)(P_V / Q_X)]$ is Vietnam's total excess supply elasticity, $v [= (Q_{US} / P_V)(P_V / Q_{US})]$ is an elasticity that tells how a change in the Vietnamese price affects Vietnam's exports to the US market, and $_{NUS} [= (Q_{NUS} / P_V)(P_V / Q_{NUS})]$ is an elasticity that tells how a change in the Vietnamese price affects Vietnam's ex-

ports to non-US markets. From equation (10), the total excess supply elasticity is a quantity-share weighted average of the market-specific elasticities. In the trivial case where Vietnam exports only to the US ($Q_{NUS} = 0$), the total and US-specific elasticities are identical; *i.e.*, $e_S = \epsilon_V$.

More generally, the relationship between e_S and ϵ_V is defined as:

$$\epsilon_V - e_S = (Q_{NUS}/Q_X)(\epsilon_V - \epsilon_{NUS}).$$

From this expression, ϵ_V may be larger or smaller than e_S depending on the relative magnitudes of ϵ_V and ϵ_{NUS} . Intuitively, Vietnam's propensity to export to alternative markets should be related to those markets' proximity. According to best estimates, Vietnam's catfish exports are distributed as follows: 50% to US, 23% to Asia, 15% to Europe, and 12% to ROW (Crews 2002). With this in mind, it is not unreasonable to suppose that $\epsilon_V = \epsilon_{NUS}$, in which case $\epsilon_V = e_S$.

The issue then reduces to e_S 's magnitude. By definition (see Houck 1986, p. 34):

$$e_S = (Q_S/Q_X) \epsilon_V + (Q_D/Q_X) \epsilon_V,$$

where Q_S and Q_D are Vietnam's domestic production and consumption of catfish, respectively; ϵ_V is Vietnam's domestic supply elasticity for catfish; and ϵ_V is Vietnam's domestic demand elasticity in absolute value. Based on best estimates, 90% of Vietnam's production is exported (Crews 2002). This implies:

$$e_S = 1.11 \epsilon_V + 0.11 \epsilon_V,$$

which, upon substituting $\epsilon_V = 0.73$ and $\epsilon_V = 1.42$ (best-bet US values) yields $e_S = \epsilon_V = 0.96$. Since the values used for ϵ_V in table 2 are above 0.96, there appears little danger that the results are prejudiced against the tariff. In fact, results for $\epsilon_V > 1$ should be conservative in this regard.⁵

The results in table 2 are based on the assumption that the ϵ_i parameters are fixed constants. In reality, the tariff would shrink ϵ_V and expand ϵ_R and ϵ_{US} . Taking this endogeneity into account puts the tariff in an even worse light than indicated in table 2. This is demonstrated in table 3 where we have simulated ϵ_V and ϵ_{US} for alternative values of ϵ_V holding ϵ_R constant at its 2001 value, ϵ_R constant at 4, and ϵ_{US} constant at 1.42. As can be seen, ϵ_V increases steadily with decreases in ϵ_V , which causes ϵ_{US} to decline. For example, a reduction in ϵ_V from 0.129 (its 2001 value) to 0.06 would cause ϵ_V to increase from 11 to 24 in the short run and from 16 to 36 in the long run. Focusing on the long-run result, the associated reduction in US incidence is from 16% to 8%. Thus, if the tariff were successful in cutting Vietnam's import share by this magnitude, the results in table 2 would *overstate* the tariff's impact by 50%. Combining this result with the results for the ϵ_V parameter, it appears safe to say that table 2 overstates rather than understates potential impacts.

⁵ In essence, Vietnam is less important to the US as a trading partner than *vice versa*. As a result, it is easier for the US to find alternative supply sources in response to a rise in the Vietnamese price than for Vietnam to find new markets. This explains why ϵ_V is small in relation to ϵ_V . That is, in trade theory parlance, the monopoly/monopsony power balance favors the US (see Syropoulos 2002).

Table 3
Relationship Between Import Share, Import Demand Elasticity, and US Incidence of Tariff

Import Share (ϵ_v)	Demand Elasticity (ϵ_v) ^a		Incidence (ϵ_v) ^b	
	Short Run	Long Run	Short Run	Long Run
0.129	11.3	16.1	0.08	0.16
0.12	12.1	17.4	0.08	0.15
0.10	14.5	21.0	0.06	0.12
0.08	18.2	26.5	0.05	0.10
0.06	24.2	35.5	0.04	0.08
0.04	36.3	53.7	0.03	0.05
0.02	72.6	108.1	0.01	0.03

^a Based on formula $\epsilon_v = (\epsilon_{US} + \epsilon_{US} \epsilon_{US} + \epsilon_R \epsilon_R) / \epsilon_v$ with $\epsilon_{US} = 1.42$, $\epsilon_R = 4$, $\epsilon_R = 0.008$, and $\epsilon_{US} = 1 - \epsilon_R - \epsilon_v$. The ϵ_{US} parameter is set to zero for the short-run simulations and to 0.73 for the long-run simulations.

^b Based on formula $\epsilon_v = \epsilon_v / (\epsilon_v + \epsilon_v)$, where $\epsilon_v = 1$ for short run and $\epsilon_v = 3$ for long run.

Win-Win Solution

Given the tariff's limited effect on US price, and its potential to undermine the US's credibility as a free-trade advocate, better alternatives must exist. One possibility is market promotion. Specifically, imports could be taxed with the proceeds used to conduct generic advertising. This is the approach taken in the salmon trade dispute between Norway and the European Union (Bull and Brittan 1997). In addition to being consistent with a free-trade posture, promotion can be "win-win" in that domestic and foreign producers alike can benefit (Kinnucan and Myrland 2002, 2003). In instances where the domestic industry already supports generic advertising, a "promotion tax" on imports can be justified in that it eliminates free riding. In the catfish case, promotion is currently funded via a voluntary \$5/ton assessment on catfish feed. This generates an annual budget of about \$4 million, which is equivalent to 0.6% of wholesale value. Research suggests that program intensification would increase domestic producer surplus (Kinnucan and Paudel 2001). Hence, by extending the promotion "tax" to include imports, it should be possible to increase the economic surplus of domestic as well as foreign producers.

Optimal Levy

Foreign producers' incentive to invest in domestic market promotion can be assessed with appropriate modifications to the model. First, we include an advertising variable in the domestic demand equation as follows:

$$D^* = -P_{US}^* + A^*, \quad (1a)$$

where ϵ is the advertising elasticity and A^* is the relative change in advertising expenditure. Next, we define tax revenue (= advertising expenditure) as:

$$A = T_M - M,$$

where $M = M_V + M_R$ is total imports and T_M is the per-unit promotion tax. Taking the logarithmic differential of the above equation yields:

$$A^* = T_M^* + k_V M_V^* + k_R M_R^*, \quad (11)$$

where $k_V = M_V/M$ and $k_R = M_R/M$. Since the tax is against all imports, we replace the V subscripts in equation (5) with M . Since ROW exporters are now taxed along with Vietnamese exporters in equation (4), we set P_{US}^* equal to P_M^* , where P_M^* is defined as the change in “net price;” *i.e.*, the US price exclusive of the promotion levy.

With these modifications, the key question from Vietnam and ROW suppliers’ perspective is the extent to which the promotion can increase the net price.⁶ To determine this, we solve equations (1a), (2) – (6), and (11) simultaneously for P_M^* to yield:

$$P_M^* = \left\{ \left[- \left(+_{US} \right)_{US} \right] M \right\} T_M^*, \quad (12)$$

where $\left[- \left(+_{US} \right)_{US} \right] M$ is a complex expression of no interest here except to note that its sign is positive for normal parameter values. From equation (12), whether or not an increase in the tax increases the net price is ambiguous. In particular, in the short run where $_{US} = 0$, $P_M^*/T_M^* > 0$ only if $>_{M}$, *i.e.*; the advertising effect exceeds the tax effect. Since the tax and the advertising have opposite effects on net price, this result is intuitive. In fact, to maximize foreign producer surplus, T_M should be increased to the point where the supply shift associated with the tax just cancels the demand shift associated with the advertising so that $P_M^*/T_M^* = 0$ (see Kinnucan and Myrland 2000 and references cited therein). In terms of equation (12), this condition implies:

$$^o_M = / (+_{US} \)_{US}, \quad (13)$$

where o_M is the optimal tax rate; *i.e.*, the optimal *per-unit* tax expressed as a fraction of P_{US} . From equation (13), foreign producers’ incentive to invest in domestic market promotion increases as: (i) advertising’s ability to shift the domestic demand curve increases (larger $\left[- \left(+_{US} \right)_{US} \right] M$), (ii) domestic consumers or producers become less sensitive to price (smaller $\left[- \left(+_{US} \right)_{US} \right] M$), and (iii) exporters’ domestic consumption share increases (smaller $_{US}$).⁷

Condition (13) indicates the tax rate that maximizes foreign producer surplus when the tax rate on domestic production (= 0.6%) is held constant. If the tax rate on domestic production is permitted to vary, a global condition can be derived that indicates the “best” tax rate for domestic and foreign producers combined. That condition is:

$$^o = / , \quad (14)$$

⁶ A reviewer questioned how introduction of P_M into the model handles the wedge between the Vietnamese and US price, which motivated the dumping tariff in the first place. The answer is that the wedge will remain, as promotion, if effective, will cause a generalized rise in the US price. But the crucial question is not whether promotion can eliminate the wedge, but whether the net benefit to US producers is higher. That, in turn, depends upon which instrument, a targeted tariff or a smaller generalized tariff *cum* promotion, has a larger effect on the US price.

⁷ Equation (13) is a new result in the commodity promotion literature. Specifically, Freebairn and Alston’s (2001, table 1) summary of optimality conditions contains no result for the net importer case. Equation (13) fills that gap (see also footnote 8).

which is the familiar Dorfman-Steiner theorem (Dorfman and Steiner 1954). Equation (14) indicates a higher tax rate than (13) because the free-rider problem is eliminated. That is, with a uniform tax on domestic production and imports, neither group gains an advantage from the promotion scheme. This increases each group's incentive to contribute to the program, as the tax is deemed "fair."⁸

Simulation

With the foregoing in mind, we simulated equations (13) and (14) for alternative parameter values as indicated in table 4. The advertising elasticity is varied along the interval [0.005, 0.050], which contains Zidack, Kinnucan, and Hatch's (1992) estimate of 0.0066 and Kinnucan and Miao's (1999) more recent estimate of 0.0244. These estimates indicate the demand shift for *all* catfish without regard to product form. Since not all imported catfish are frozen fillets, and to keep the analysis general, ϵ is interpreted as pertaining to all catfish, not just frozen fillets. As mentioned, Kinnucan and Miao's (1999) point estimate of this parameter is 0.71. To indicate sensitivity of results to the demand elasticity, ϵ is increased and decreased by 50% from its baseline value.⁹ The supply elasticity in equation (13) is set to $\epsilon_{US} =$

Table 4
Optimal Advertising Levy on Imported Catfish

Advertising Elasticity (ϵ)	With Free Riding (ϵ_M)			Without Free Riding (ϵ)		
	$\epsilon = 0.36$	$\epsilon = 0.71$	$\epsilon = 1.06$	$\epsilon = 0.36$	$\epsilon = 0.71$	$\epsilon = 1.06$
0.005	0.005	0.004	0.003	0.014	0.007	0.005
0.010	0.010	0.007	0.006	0.028	0.014	0.009
0.015	0.014	0.011	0.009	0.042	0.021	0.014
0.020	0.019	0.014	0.011	0.056	0.028	0.019
0.025	0.024	0.018	0.014	0.070	0.035	0.023
0.030	0.029	0.021	0.017	0.085	0.042	0.028
0.035	0.034	0.025	0.020	0.099	0.049	0.033
0.040	0.038	0.029	0.023	0.113	0.056	0.038
0.045	0.043	0.032	0.026	0.127	0.063	0.042
0.050	0.048	0.036	0.029	0.141	0.070	0.047
Mean Value ($\bar{\epsilon}$)	0.028	0.021	0.016	0.077	0.039	0.026
Added Promotion Budget (mil. \$) ^a	1.14	0.83	0.66	3.15	1.58	1.05

^a Computed as $\bar{\epsilon} \cdot P_{US} \cdot M$, where $P_{US} = \$2.25/\text{lb.}$ and $M = (M_V + M_R) = 18.1$ million lbs. (see table 1). The current promotion budget is about \$4.0 million.

Note: ϵ refers to the demand elasticity for all catfish products, not just frozen fillets.

⁸ Conditions (13) and (14) are incomplete in that we have not considered the case where foreign producers are permitted to free ride. In this case, the optimal levy from the domestic producer perspective is $\bar{\epsilon}_D = \epsilon / (\epsilon + \epsilon_M \epsilon_M)$, where ϵ_M is import share and ϵ_M is the import supply elasticity. Since $\bar{\epsilon}_D < \epsilon$, the interpretation is symmetric with respect to the "fairness" issue.

⁹ One might argue that ϵ overstates price sensitivity in that demand interrelationships are not taken into account (Buse 1958). However, as shown by Kinnucan (1996), ignoring demand interrelationships would also tend to cause ϵ to be overstated. Since ϵ and ϵ_M enter the optimality conditions as a ratio, substitution effects tend to be self-cancelling.

0.73, the value consistent with the long-run simulations presented in tables 2 and 3. Since imported catfish accounted for 6% of total processed volume in 2001 ($= [(M_V + M_R)/Q_W] \times 100$, see table 1), we set $\epsilon_{US} = 0.94$.

Focusing first on the situation where the domestic levy is held constant, the optimal levy on imports, evaluated at mean advertising responses, is between 1.6% and 2.8%. This levy generates between \$0.66 million and \$1.14 million in additional funds. At existing funding levels, these monies would expand promotion by between 17% and 28%.

If the levy on domestic production is changed in tandem with the levy on imports so that neither group free rides, the optimal import levy increases to between 2.6% and 7.7%. In this case, the budget is enlarged by between \$1.1 million and \$3.2 million, a significant increase over the current budget of \$4 million. Thus, requiring domestic producers to contribute at the same rate as foreign producers significantly enhances foreign producers' incentive to participate in the marketing effort. Although domestic producers may be unwilling to go along with a rate hike, clearly it is advantageous to both groups that imports be assessed. The results in table 4 provide a basis for determining what that assessment should be when the goal is to maximize foreign producer surplus. Taking $\epsilon_{US} = 0.71$ as the best-bet overall demand elasticity, the optimal levy on imports would appear to be in the 2% to 4% range.

Concluding Comments

This study uses an equilibrium displacement model to assess the efficacy of targeted tariffs as a policy tool to assist domestic fish producers. Results indicate that such tariffs are problematic in that import demand from a particular supply source tends to be highly price elastic, both absolutely and in relation to import supply from that source. As a consequence, most of the tariff's burden is borne by that particular country's foreign producers rather than domestic consumers. A related problem is that a targeted tariff stimulates imports from non-taxed supply sources, which further undermines the tariff's ability to raise domestic price. It is not surprising, therefore, that empirical evidence provides little support for the hypothesis that targeted tariffs benefit US producers (Asche 2001; Brester, Marsh, and Smith 2002). Indeed, model simulations suggest that a \$0.50/lb. tariff on US catfish imports from Vietnam would do more to punish Vietnamese producers than to reward US producers.

Given that targeted tariffs are *a priori* ineffectual, costly to implement, and invite retaliation, better alternatives must exist. One possibility is market promotion. Market promotion is an attractive alternative in that it can be "win-win;" *i.e.*, benefit domestic and foreign producers alike. Exploring this option, we find that foreign producers' incentive to invest in domestic market promotion is identical to domestic producers' incentive, provided both groups are assessed at the same rate. Applying this principle to catfish and utilizing recent estimates of promotion and price responses, study results suggest the optimal "promotion tax" on imports is in the range of 2% to 4%.¹⁰

A caveat in interpreting our results is that we have focused strictly on producer impacts. If the goal is to maximize national welfare (= tariff receipts plus domestic

¹⁰ Another alternative, suggested by my colleague Henry Thompson, is a lump-sum "buy-out." That is, simply give every commercial producer a one-time payment of (say) \$0.5 million with the understanding that he/she must then accept import competition. This would avoid tariff-based dead weight losses, benefit domestic consumers, and maintain compliance with free-trade principles.

producer and consumer surplus), a targeted tariff might be preferred since foreign producers bear most of the tariff's incidence (Enke 1944). Advertising increases consumer surplus if it provides useful information, or enhances product image; the opposite is true if it is strictly persuasive (Tremblay and Tremblay 1995). Some contend that generic advertising is more persuasive than informative (*e.g.*, Crespi and Marette 2002). Moreover, increased advertising for catfish might stimulate increased promotion by competing fish producers, which could erode the effect of the initial promotion increase. Still, if the goal is to assist domestic producers, promotion would appear to have the edge as a policy instrument, as targeted tariffs are problematic both from theoretical and empirical perspectives.

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